

US EPA ARCHIVE DOCUMENT



Global Air Quality Assessment and Forecasting

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Proposed Topic for the 2007 GEO Ministerial Meeting

Proposed U.S. Priorities at GEO Summit

- **Global Air Quality Assessment and Forecasting**
- **Drought Early Warning**
- **Global Land Characterization**
- **Global Environmental Information Delivery System**
- **Framework for Integrated Disaster Risk Reduction**



Global Air Quality Assessment and Forecasting

- Air pollution is a serious global public health and environmental quality issue. Air pollution causes premature mortality and morbidity, damages crops and ecosystems, and contributes to and is affected by climate change.
- Improved air quality information and forecasts can help officials and individuals take appropriate management actions and avoid exposures.
- Regional and long-range transport of pollutants is significant and creates a need for international implementation of integrated monitoring and assessment approaches.
- Forecasts and real-time information are especially useful for dealing with events, such as intense pollution episodes, fires, and dust storms, and are critical for individuals suffering from respiratory diseases.

In the U.S., poor air quality is estimated to cause tens of thousands of deaths and cost society \$100B annually.

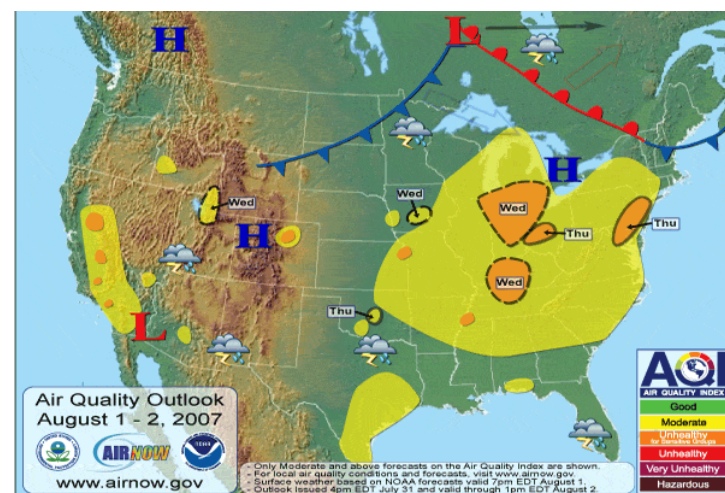
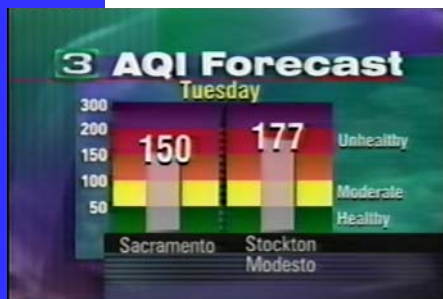
Globally, air pollution contributes to the deaths of more than 800,000 people annually, most in the developing world.

Global Air Quality Assessment and Forecasting

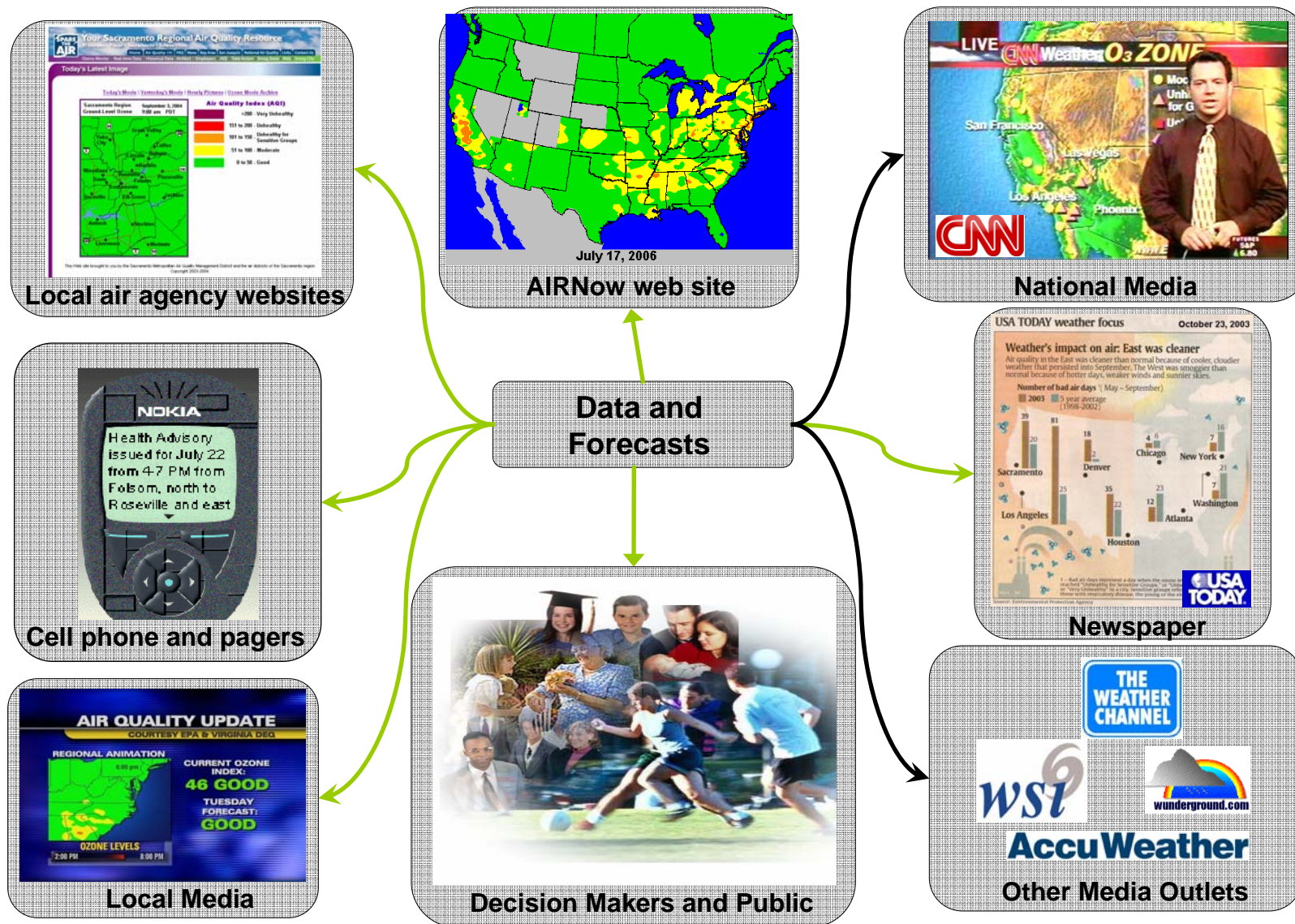
- Creating “international versions” of U.S. tools
 - AIRNow International (EPA)
 - Near real-time management and mapping of surface air quality data
 - Pilot international application in Shanghai, China
 - IDEA/3-d Air Quality System (NASA)
 - Near real-time integration of satellite and surface air quality data
 - Pilot international application in Central America through SERVIR
 - Geostationary Satellite AOD Algorithms (NOAA)

AIRNow Overview

- AIRNow (www.airnow.gov)
 - Centralized, nationwide system for surface air quality monitoring data and forecasts
 - Main purpose – to provide data to public (AQI)
 - 120+ federal, state, provincial, tribal, and local air agencies participate
 - Real-time products (maps, data feeds, forecasts)
- Serves as a conduit for communications and support between EPA and federal, state, local, tribal, and international agencies
- An air quality resource for public, media, researchers, ...



AIRNow - Product Distribution



Global Air Quality Assessment and Forecasting

- AIRNow-International Scoping Study
 - Develop the initial specifications for a software package to collect, process, map, and distribute real-time surface air quality information
 - Design to maximize portability, interoperability, flexibility, and sustainability
 - Initial target implementation: Shanghai, China

Infusing satellite Data into Environmental Applications (IDEA)


A joint NASA-NOAA-EPA initiative:

Objective - Prototype a near-real-time MODIS trajectory forecast product using MODIS direct broadcast aerosol optical depth over CONUS.

Goal - Improve accuracy of next day PM_{2.5} Air Quality Index (AQI) by providing pseudo-synoptic aerosol observations and trajectory forecast during large aerosol events.

- EPA, NOAA, NASA, University Researchers, and Air Quality Forecasters prototyped a system demonstrated during Summer 2003.
- Pseudo-operational System implemented at CIMSS May 2004. Forecast tool for AQ forecasters through direct link with AIRNow-TECH.
- Currently in pre-operational mode at NESDIS.

Benefit - Enable improved mitigation of health effects caused by episodes of poor air quality



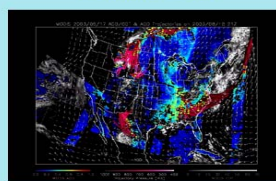
IDEA
Infusing satellite Data into Environmental Applications
The IDEA team values your feedback! Please send any comments, problems and suggestions to IDEA-AQI@shire.larc.nasa.gov.

NASA
AIRNOW
MODIS
WF181.1

Latest Forecast Discussion

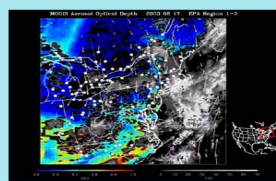
We are trying to get all of products back on line. The next several days will be a testing period for some changes.
CK 20040317 2:40PM

Forecast Trajectories for MODIS Aerosol Optical Depth, Cloud Optical Thickness and 48 hour Air Parcel

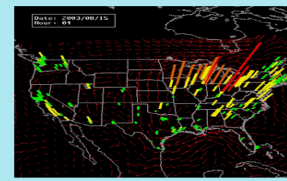


Product description
View latest

Regional Summary Plots of MODIS Aerosol Optical Depth and Cloud Optical Thickness

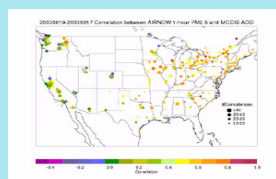


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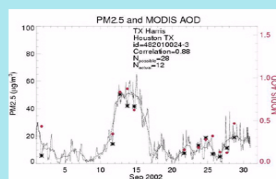
Product description
View latest

National Correlation Map between PM_{2.5} and MODIS Aerosol Optical Depth



Product description
View latest

Time-series between MODIS Aerosol Optical Depth and PM_{2.5} 24hr concentrations



Product description
Select Site

About IDEA...

IDEA (Infusing satellite Data into Environmental Applications) is a partnership between the National Aeronautics and Space Administration (NASA), the United States Environmental Protection Agency (EPA), and the National Oceanic and Atmospheric Administration (NOAA) in an effort to improve air quality assessment, management, and prediction by infusing satellite measurements (from NASA) into analyses (by EPA and NOAA) for public benefit.

IDEA is a part of the NASA Earth Science Enterprise (ESE) Applications Program strategy to demonstrate practical uses of NASA sponsored observations from remote sensing systems and predictions from scientific research.

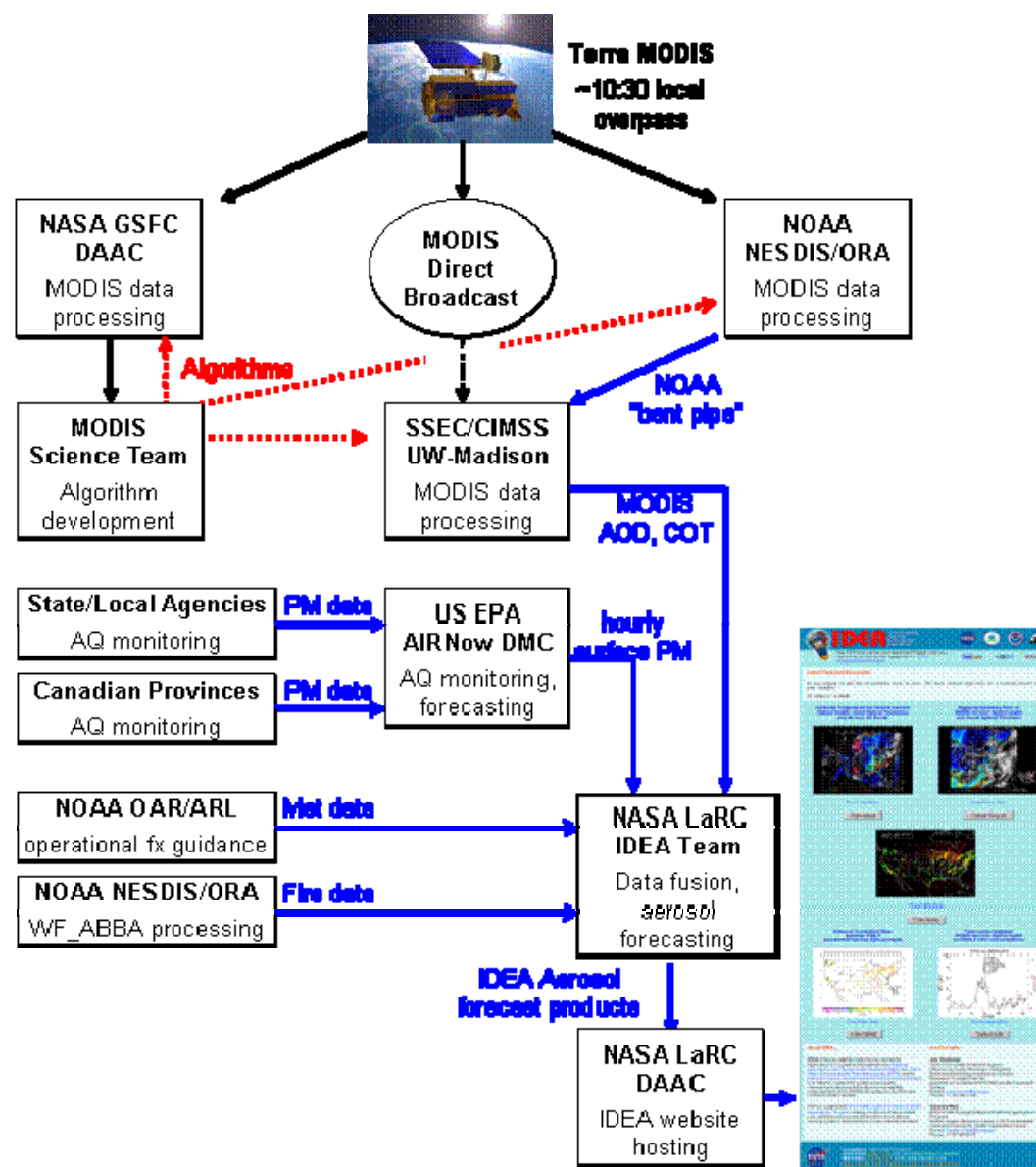
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Al-Saadi et. al., September 2005,
Bulletin of American Meteorological Society

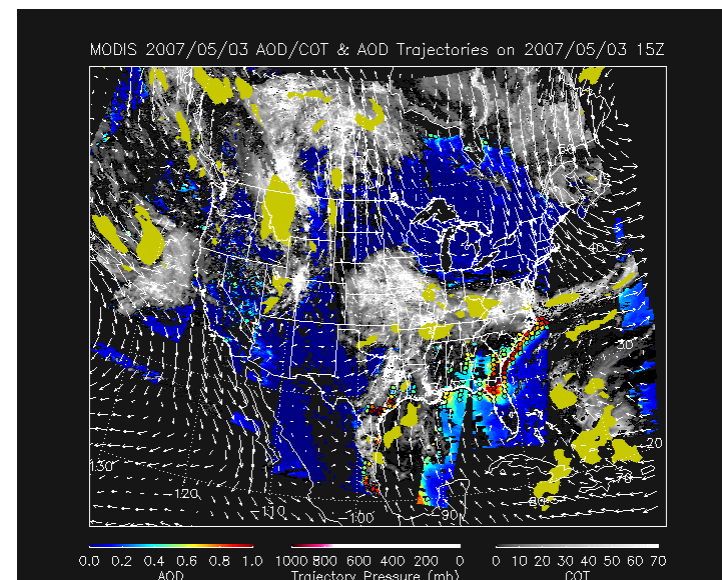
IDEA Data Architecture



IDEA Products

- **Provides forecast guidance for surface air quality (PM_{2.5})**
 - Dust storms, Smoke, Haze
- **AOD moved forward with forecast model**
 - Trajectories are initialized at locations with aerosol optical depth > 0.4 at 50, 100, 150, and 200mb
 - Run using 12Z NOAA/NCEP NAM forecast data providing 48 hr forecast
- **System requirements**
 - Direct broadcast receiving station for satellite data
 - Trajectory model
 - Regional meteorological forecast model output
 - Algorithms to derive aerosol optical depth or related parameters
 - Surface mass aerosol monitors
- **System flexibility**
 - Easily adaptable to other regions of the globe or input from other satellites
 - Easy to modify to input other satellite data (e.g., FY or GMS satellite data products)

Forecast Product for May 3, 2007



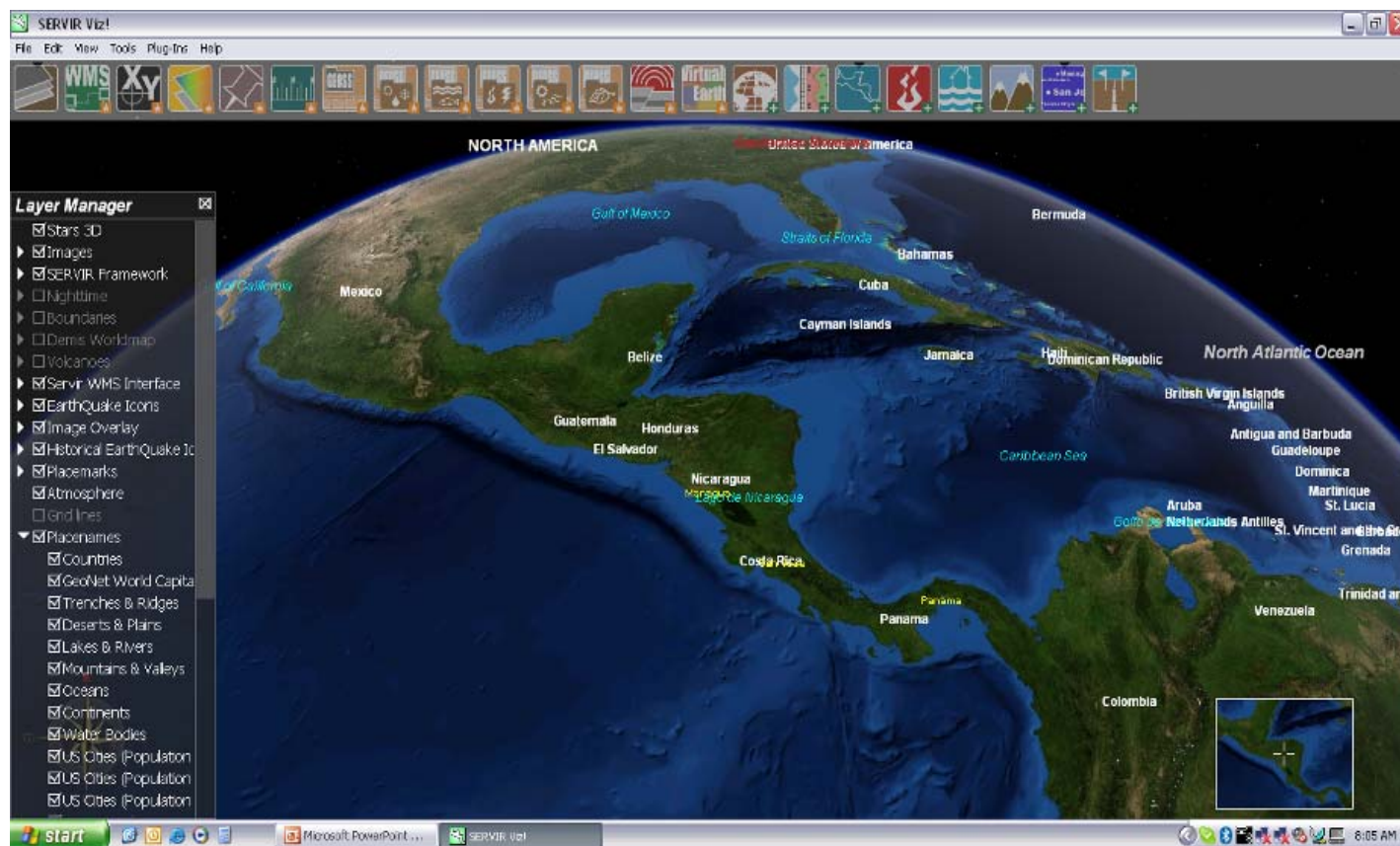
48-hr trajectory forecast initialized with satellite (MODIS) observations of Aerosol Optical Depth. Pink color in the forecast trajectories indicates pollution will be closer to the ground

3D-AQS

- UMBC and Battelle with funding from NASA's Applications Program
- Objectives:
 - Expand IDEA and migrate to NOAA
 - Add ground based lidar and other satellite data
 - Migrate from UW Madison to operational status at NESDIS
 - Incorporate satellite data into EPA's air quality data system
 - Improve 3-D Visualizations

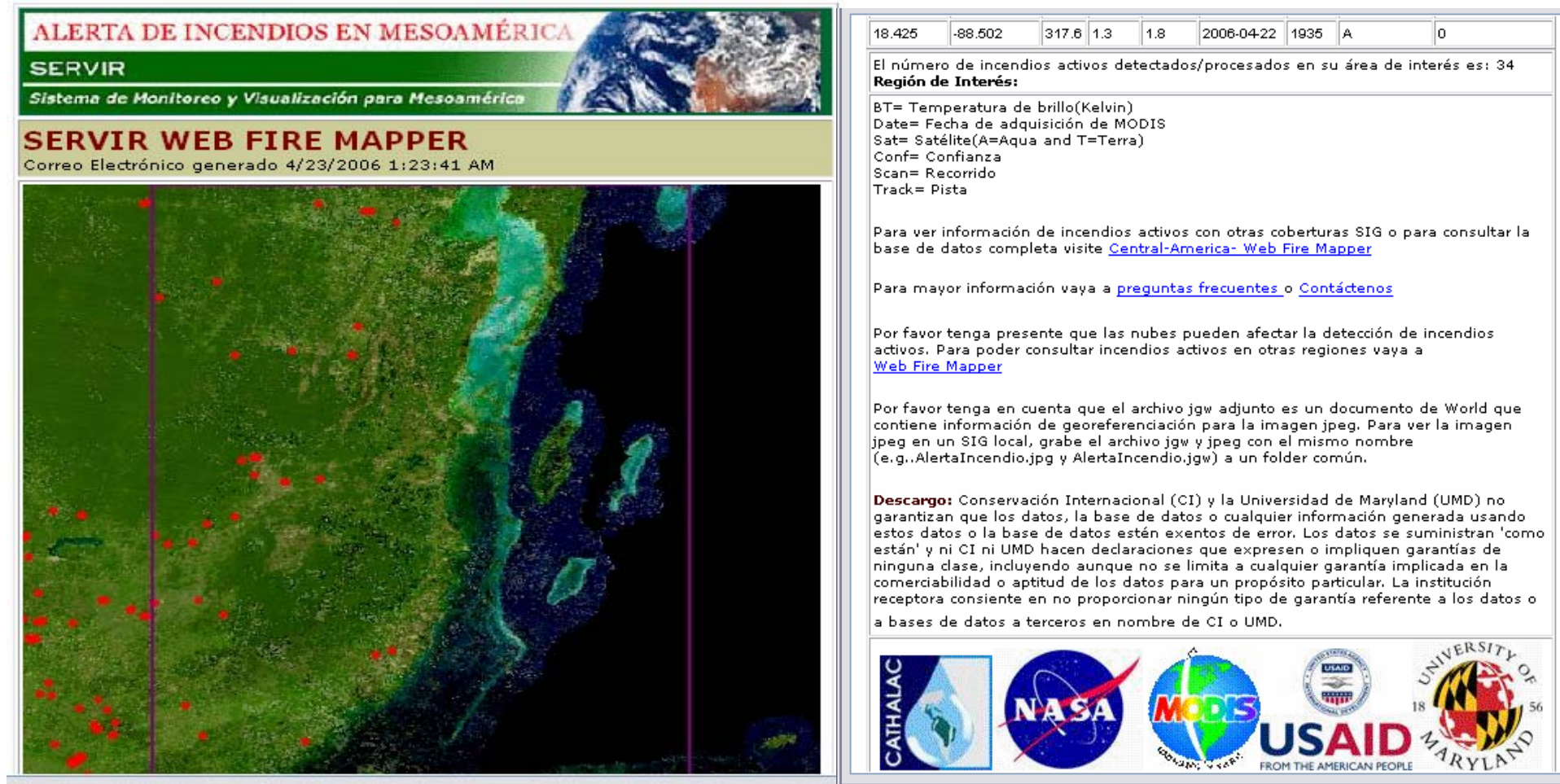
SERVIR

SERVIR, a web-based system that integrates remote sensing data (satellite and *in situ*) and geospatial information for mapping, monitoring, and 3-D visualization of the earth



SERVIR Web Fire Mapper:

Just One Example of a Disseminated Product



Satellite-derived Fire Maps & E-mail alerts for the People of Central America

Global Air Quality Assessment and Forecasting

- SERVIR-Air Quality Pilot Study
 - Currently in the planning stage
 - NASA, EPA, USAID, and the SERVIR partners
 - Potential tasks:
 - Provision of Air Quality Products through SERVIR integrating capabilities from IDEA, 3D-AQS, and other relevant products
 - Establishment of Additional Ground-Based Monitoring and Data Management System (i.e. AIRNow-I)
 - Training and Outreach

Global Air Quality Assessment and Forecasting

- Creating “international versions” of U.S. tools
 - AIRNow-International Pilot
 - SERVIR-Air Quality Pilot Study
 - Geostationary Satellite Retrieval Algorithms
- Call for ministers to support development of air quality information systems and to make relevant data available
- Seek international participation and coordination

Global Air Quality Assessment and Forecasting

- Form an Advisory/Coordination Committee
 - Gather input from other countries on design of the systems
 - Seek standardization and interoperability
 - As part of an AQ/Health Community of Practice
 - Connect to CEOS Atmospheric Composition Constellation, ADM interoperability efforts, and other related efforts
 - Possible meeting at the GEO Plenary/Summit
 - Use of web-based collaboration

Global Air Quality Assessment and Forecasting

- Suggestions from the UIC?
 - Considerations for forming an advisory/coordination group
 - Role within an Air Quality Community of Practice
 - Individuals or programs to connect with
 - Relationships to other parts of GEO